ERP AND KNOWLEDGE MANAGEMENT INTEGRATION: THE CASE OF MALAYSIAN BUSINESS FIRMS

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Abstract

In order to compete in a global environment, Malaysian business firms need to improve their products and services through best practices. This paper aims to investigate the critical success factors to adopt Enterprise Resource Planning (ERP) with knowledge management (KM) strategies among Malaysian business firms. In order to achieve the research aim, four-hundred eighty eight ERP with KM using firms were surveyed using questionnaires form. A total of 151 firms responded to the survey by indicating that successful ERP implementation lie at firms' capacity to train their staff on ERP software, meeting clear goals and objectives as well as top management support. This paper provide advice to management on how best to utilize their limited resources to choose those CSFs that are most likely to have an impact during the implementation of the ERP with KM strategies. These processes if deployed effectively, can lead toward successful ERP implementation and leveraging the knowledge kept in the organizations. This is one of the first papers that investigate the CSF for ERP with KM strategies for Malaysian business firms.

Keywords: Enterprise Resource Planning (ERP), Knowledge management (KM),

Information and Communication technologies (ICT), software, business process

1.0 INTRODUCTION

The globalization factors stimulate firms to carry out strategic initiative to create and sustain business competitiveness through knowledge based economy. Knowledge based economy places great importance in managing knowledge through information and communication technologies towards competitive business processes. In today's business environment, the success of a business firms can be linked to how well they manage and present their knowledge through information and communication technologies (ICT) for a sustainable business growth.

The ICT based applications could only be considered significant if it is integrated with knowledge management (KM). ICT applications help firms to streamline business operations and integrate functionalities while KM maximizes the usage of ICT applications (Mudiarasan et al, 2009). The literature abounds with successful ICT adoption by firms with KM (DeLone & E.R McLeon, 1992). Nevertheless, there are also significant numbers of studies that have argued on firms not reaping the expected economic benefit from ICT investment due to the lack of KM (Robert et al., 2003). A similar stance is also advocated for Enterprise Resource Planning (ERP) system – one of the most profoundly used ICT applications in recent times. Enterprise Resource Planning systems are being widely used by large enterprises to integrate the business processes and functions into a single centralized system. The software is designed to integrate various modules such as financial, sales, human resource, supply chain, material requirement planning and customer information. The ERP software is very complex and need to be carefully managed to reap the benefits from the

implementation. Hence, many companies are encouraged to have a strategic knowledge management (KM) approach before the full cycle implementation of ERP.

A lot of firms in the developing countries such as Malaysia face numerous challenges in implementing technologies such as Enterprise Resource Planning (ERP) systems due to lack of human and financial resources to support such initiatives (Wright et al., 2002). Furthermore, the government's commitment to the development of technology infrastructure can also be seen from the Malaysian Industrial Master Plan from 2006-2020, coinciding with the country's vision for 2020 (MITI, 2007). Various studies have revealed that not all ERP implementations are successful in improving the productivity and competencies of a company. According to Thomas L. Legare (2002)**,** ERP implementation failure rate is from 40% to 60%, yet companies try to implement these systems because they are absolutely essential to responsive planning and integration of business processes. It has been found that, unique risks in ERP implementation arises due to tightly linked interdependencies of business processes and lack of knowledge management strategies among employees from different departments to maximize the usage of ERP (Wright & Wright, 2002). Hence Wright & Wright (2002) and many other ERP journals has stressed that KM plays an important role for a successful ERP implementation. The primary objective of this study is to examine the critical success factors of ERP implementation and knowledge management integration to minimize the ERP implementation failure rate among the local companies.

2.0 LITERATURE REVIEW

The term "Enterprise Resource Planning" was initiated in the early 1990s as a software solution that integrates information and business processes to enable

information sharing among the departments in an organization. The range of functionality and use of ERP systems has further expanded in recent years to include business intelligence, customer relationship management (CRM) and electronic commerce. This has led to the complexity of the system and companies started to acknowledge the importance of managing the knowledge and experience to maximize the usage of the system. Hence, KM became one of the most important requirements to implement ERP systems. Common examples of ERP systems available include SAP ERP, Oracle, Baan and PeopleSoft.

2.1 ERP and Knowledge Management (KM)

Since mid 1990s, the number of ERP using firms has been growing significantly. Caldwell & Stein (1998) reported that ERP system has become a part and parcel of firms with over $1 billion annual turnover in the year 1998. AMR Research (1999) for instance gave positive prediction of ERP market reaching $6 billion by 2003. Huang and Palvia (2001) accounted global ERP licensing revenue reaching $21.5 billion in the year 2000. Markus et al., (2000) highlighted that nearly 70% of Fortune 1000 firms who are using ERP system are also concentrating into knowledge management. According to Markus et al., KM allows a company to manage the change and allow the culture to move towards sustainable ICT based environment.

According to Davenport and Prusak (1998), KM is defined as the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives. Knowledge management is based on applying the fullness of an organization's knowledge to its decisions, and this requires working hard to represent it, transfer it, make it accessible and encourage its use with enterprise software such as ERP. The growth in ERP users across the globe implies successful

adoption to the system through the integration of KM strategies. In lieu of the failure cases, empirical and non-empirical studies have shown various critical success factors that can assist in avoiding adoption failure.

2.2 Critical Success Factors for ERP with KM Adoption

Nah et al. (2001) investigated critical success factors for ERP implementation by conducting a literature review. They found that some of the key organizational issues were KM through teamwork, top management support, plan and vision, business process management and development, project management, monitoring, effective communication, software development and testing. Their study shows that the complex organizational change issues must be comprehensively addressed and that they cannot be overcome by using technical solutions alone. Somers and Nelson (2004) are well-known as one of the top 'guru' of ERP and KM implementation who came up with the unified critical success factor model for the industries in United States. The idea is to test the model/factors proposed by these authors and see if it is applicable in the context of a developing country. According to Cooper and Zmud (1990), the implementation of ERP with KM process consists of six phases: initiation, adoption, adaptation, acceptance, routinization, and infusion. A comprehensive study was done by Nah and Delgado (2006) to identify the factors related to successful ERP implementation. At the end of the study they came up with seven broad categories as the main factor of successful implementation.

Huang and Palvia (2001) reviewed ERP implementation differences in developed and developing countries and concluded that economic status, lack of expertise or knowledge on business process management as the major hindrance for firms in developing countries to reap the benefits from ERP investment. Nah and Degaldo

(2006) on the other hand compared success factor differences between North American and Hong Kong firms. The author found that firms in Hong Kong reap lower tangible and intangible benefits from ERP usage as they have lower information access capability and knowledge disintegration. Huang et al. (2004) conducted a survey on various Taiwanese firms with the aim of identifying the critical factors for ERP with KM adoption failure. The findings indicate that ineffective employee training as the primary factors for ERP failure.

3.0 RESEARCH METHODOLOGY

A total of 488 sample firms detail which has adopted ERP with KM were collected. The lists of sample firms were obtained from several sources including Small and Medium Industries Development Corporation (SMIDEC), Federation of Malaysian Manufacturers (FMM) and Multimedia Development Corporation Malaysia (MDeC). A total of one-hundred and fifty one respondents or thirty one percent has responded to the questionnaires. The survey questions consist of 3 sections with specific focus on KM and implementation strategies as in Table 1.

Table 1: Questionnaire Categories

Categories	Subcategories
Knowledge Management (KM)	Interdepartmental cooperation, User training on software, Education on new business process
Business Process & Requirement study (Implementation)	Clear goals and objective, Careful package selection, Data analysis and conversion, Dedicated resources, Business process reengineering, Minimal customization, Architecture choices, Change management Use of vendors' tool
Project and Communication Management (Implementation)	Top management support, Project team competence, Project management, Interdepartmental communication, Management of expectation, Project champion, Vendor support, Use of steering committee, Partnership with vendor, Use of consultants

3.1 Measurement

In order to identify the critical success factors, a total of twenty two questions were used which was adopted from Somer and Nelson (2004). The respondents were asked to indicate their extent on each factor which was important in their ERP with KM implementation stages. It was measured based on a five point likert scale. The rating scale ranged from: ‘1-strong disagree (SD) to ‘5-strongly agree (SA).

Section A involved in identifying key constructs to examine the business information, information about ERP system and modules used, perceived benefits from using the ERP system and perceived barriers in adopting ERP system in the organization. Questions in section B were designed to examine the important factors needed to look into during ERP adoption process. The questionnaires were designed based on the findings of Somer and Nelson (2004). The Section C of the survey questionnaire addresses the expected business outcome of an organization, adapted from Karimi (2008).

The final stage was the collation and analysis of the response data as shown below:

1. A descriptive analysis was carried out in order to understand the distribution of the responses obtained from the survey.
2. A one-sample t-test was conducted on the means of the skill and channel variables to identify the statistically significant constructs (if any). The test was used to identify the skills with means significantly different from 3.0 (the midpoint of the scale); variable with a mean significantly larger than 3.0 were regarded as important (Karimi, 2008). In addition, the p-values and 95% Confidence Interval (CI) values were observed to determine the significance

of these variables to the respondents. The p-values need to be significant at 5% level while the CI values would normally need to be closer to 0, and any negative values were considered unimportant.

4.0 FINDING AND ANALYSIS

A wide variety of industries such as retail, banking, manufacturing, professional services and utilities were represented in the responses. The descriptive statistics suggests that a wide variety of industries were represented and the information was provided by top level IS executives. According to the response date, half (50%) of the organizations reported their ERP and KM implementation was completed last year or over one year ago, 10% were near completion, and 10% were early to mid implementation. Table 2 presents the means and standard deviations for the 3 CSFs in descending order of importance for the category of KM. User training on software was viewed as most important in KM category, followed by education on new business process.

Table 2: Knowledge Management

	Mean	**Std Deviation**	**p-value@ 0.01**	**Confidence Intervals@95%**	
				Lower	Upper
User training on software	3.43	0.62	0.000	1.22	1.42
Education on new business processes	3.35	1.38	0.000	0.99	1.21
Interdepartmental cooperation	3.33	0.91	0.000	0.84	1.08

Table 3 represents CSFs related to the business process and requirements category in descending order of importance. It also shows that six out of nine factors have a mean value of more than 3.00 as well as a positive CI region. The use of vendor tools has the lowest mean value of 2.33 and further supported by negative CI region.

Table 3: Business Process and Requirement study

	Mean	Std Deviation	p-value@ 0.01	Confidence Intervals@95%	
				Lower	Upper
Clear goals and objective	4.02	1.19	0.000	0.66	0.91
Business Process reengineering	3.75	1.14	0.000	0.69	0.94
Careful package selection	3.63	0.94	0.000	0.68	0.91
Dedicated Resources	3.44	0.99	0.000	0.63	0.87
Architecture choices	3.21	1.78	0.000	0.48	0.74
Minimal customization	3.11	0.91	0.000	0.40	0.65
Change management	2.90	0.96	0.000	-0.36	-0.65
Data Analysis and conversion	2.62	1.10	0.000	-0.32	-0.60
Use of vendor tools	2.33	0.89	0.000	-0.27	-0.54

Table 4 represents the means and standard deviation for the category of Project communication and management. The top three CSFs are top management support, use of consultants and project management.

Table 4: Project Communication and Management

	Mean	Std Deviation	p-value@ 0.01	Confidence Intervals@95%	
				Lower	Upper
Top management support	3.48	0.64	0.000	0.44	0.69
Use of consultant	3.44	1.04	0.000	0.27	0.59
Project management	3.38	1.157	0.000	0.32	0.58
Project champion	3.24	0.91	0.000	0.28	0.56
Project team competence	3.23	0.88	0.000	0.20	0.50
Interdepartmental communication	3.11	1.13	0.000	0.15	0.49
Vendor support	3.01	0.81	0.023	0.02	0.32
Management of expectation	2.98	0.95	0.000	-0.21	-0.49
Partnership with vendor					

	2.45	0.88	0.000	-0.16	-0.42
Use of steering committee	2.11	1.00	0.000	-0.16	-0.45

Table 5, 6 and 7 represents the business performance outcome of the organizations. The business performance outcome has been measured based on operational efficiency, operational effectiveness and operational flexibility (Karimi, 2008). Table 5 presents the means and standard deviations for the three business outcomes in descending order of importance for the category of operational efficiency. The data shows that the most important business outcome was lowering the cost of operation, followed by the improved efficiency of operations while reduced redundancy was considered less important. Table 6 presents the means and standard deviation for the operational effectiveness with four out of five items has a mean value of more than three with a positive CI region. For Table 7, three out four factors have a mean value of more than 3.00 with a positive CI region.

Table 5: Business Performance Outcome: Operational Efficiency

	Mean	**Std Deviation**	**p-value@ 0.01**	**Confidence Intervals@95%**	
				Lower	Upper
Lowered the cost of Operation	3.44	0.58	0.000	0.71	0.97
Improved the efficiency of Operations	3.16	1.12	0.000	0.33	0.63
Reduced redundancy	2.85	1.04	0.000	-0.18	-0.49

Table 6: Business Performance Outcome: Operational Effectiveness

	Mean	**Std Deviation**	**p-value@ 0.01**	**Confidence Intervals@95%**	
				Lower	Upper
Add value to operation	3.76	1.11	0.000	0.18	0.45
High level integration	3.34	1.38	0.004	0.07	0.37
Improved quality of Operations	3.29	0.91	0.000	0.08	0.34
Improved timely access To corporate data	3.23	0.99	0.000	0.94	1.17
ERP functionalities met the requirements of job	2.93	0.80	0.000	-0.43	-0.73

Table 7: Business Performance Outcome: Operational Flexibility

	Mean	Std Deviation	p-value@ 0.01	Confidence Intervals@95%	
				Upper	Lower
Adaptive to changing Business environment	3.47	0.64	0.000	0.14	0.40
Improved operational Flexibility	3.15	1.12	0.009	0.05	0.34
More ways to customize the process	3.07	1.15	0.000	0.15	0.38
Made the company more agile	2.85	1.04	0.000	-0.13	-0.50

5.0 DISCUSSION AND RESULTS

The research findings were presented and discussed in two categories. The first category discussed about the critical success factors for ERP and KM implementation while the second category is about benefits achieved from the implementation. A study of this nature is perceived as important as the analysis could assist ERP adopting firms to identify and allocate strategic resources for successful implementation. In this study, the CSFs have been grouped under KM, business process and requirement study as well as project and communication factors. The result indicates that all the factors had an important role in successful ERP and KM rollouts. Table 8 provides an understanding of the critical factors for each category throughout the ERP implementation in the Malaysian business firms.

Table 8: Mean Rankings of CSFs by degree of importance in ERP Implementation

Critical Factors	Mean	p-value @ 0.01	Confidence Intervals@95%	
			Lower	Upper
Knowledge Management				
1.User training on software	3.43	0.000	1.22	1.42
2.Education on new business processes	3.35	0.000	0.99	1.21

3.Interdepartmental cooperation	3.33	0.000	0.84	1.08
Business Process and Requirement Study				
4.Clear goals and objective	4.02	0.000	0.66	0.91
5.Business process reengineering	3.75	0.000	0.69	0.94
6.Careful package selection	3.63	0.000	0.68	0.91
7.Dedicated Resources	3.44	0.000	0.63	0.87
8.Architecture choices	3.21	0.000	0.48	0.74
9.Minimal customization	3.11	0.000	0.40	0.65
Project and Communication Management				
10.Top management support	3.48	0.000	0.44	0.69
11.Use of consultant	3.44	0.000	0.27	0.59
12.Project management	3.38	0.000	0.32	0.58
13.Project champion	3.24	0.000	0.28	0.56
14.Project team competence	3.23	0.000	0.20	0.50
15.Interdepartmental communication	3.11	0.000	0.15	0.49
16.Vendor support	3.00	0.023	0.02	0.32

5.1 Knowledge Management

The survey analysis has shown that when considering ERP implementation, it is imperative for the employees to be trained on using the ERP software. Such finding is in line with Zhang et al's (2003) argument on the importance training for smooth knowledge transfer between supplier and user of technology systems.

5.2 Business Process and Requirement Study

It has been observed that clear goals and objectives are important for a successful ERP implementation among Malaysian business firms. This factor could be related to the project goals clarification and their congruence with the organizational mission and strategic goals. The second most important factor is business process

reengineering. The dimensions concerning the business process reengineering could be related to the company's willingness to reengineer, readiness for change and capability of reengineering (Zhang et al, 2003).

5.3 Project and Communication Management

The most frequently discussed CSF, identified through the survey analysis was that a successful ERP and KM implementation required top management support, because an implementation involves significant change to existing business processes as well as a significant amount of capital investment therefore gaining the required amount of support from senior management becomes paramount. The other frequently cited factors are issues related to the use of ERP consultants, this has been deemed vital to ERP projects because an ERP implementation typically requires a person with a sound knowledge of underlying business processes and the required technical skills to map new technologies and functionalities onto processes.

5.4 Key Benefits of ERP Implementation

This research found that the key benefits can be evaluated from three perspectives which are operational efficiency, operational effectiveness and operational flexibility (Karimi et al. 2008). As in the case of operational efficiency, this research found that organizations implementing ERP with KM incur lowered cost of operation. This is indicated by the variable mean value of 3.44 in Table 5. This factor is indirectly related to the return on investment (ROI). This is a very encouraging result. It indicates that, companies in the sample are experiencing good ERP-driven change and positive KM strategies. Table 6 summarizes that in terms of operational effectiveness, ERP with KM has added value towards the operations of the companies. The results

clearly indicated that firms that implemented ERP systems with KM concentrated on waste and its elimination which leads to the distinction between value added operations and non-value added operations. Table 7 summarizes that ERP and KM driven companies are able to adapt towards the changing business environment.

6.0 CONCLUSION

The key findings of this study would be of value to the management of the Malaysian business firms when taking decisions regarding the adoption of ERP with KM. Knowledge processes involve some form of effective collaboration with ERP to extract the best output from the costly implementation of ERP. The critical factors described in this paper can be brought into the operational domain in ways helpful for those working on the ERP implementation. One of the limitations of this study is its generalizability. The findings of this study were limited to Malaysian companies. Further analysis and research need to be done on corporations from other developing nations. Another limitation is that a wider range of critical success factors was not included due to practical constraints such as time and cost. Knowledge based management could help the organizations during turbulence times where novel solutions are needed to achieve the goals due to uncertainty about nature of the solution. ERP system could be efficient but in order to run effectively, KM need to be integrated for a successful implementation.

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Biography

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Mudiarasan Kuppusamy is doctoral student in University of Western Sydney, Australia. His research is focused on ERP system adoption in different cultural setting and is about to complete his study in another one year period. He was previously working in Monash University (Malaysia) for about 8 years and has good number of research experience and publications on information systems issue. Apart from completing his study, Mudiarasan is also involved with several large-scale research projects focused on information system requirements in Australian SMEs